AMENDMENTS TO THE SPECIFICATION

Note to the Examiner: Applicant has determined that there are certain inconsistencies between the specification as filed and as published (Publication No. US 2002/0021698 A1). These inconsistencies affect at least (i) paragraph numbering (beginning at approximately paragraph [0012]); (ii) certain instances of hyphenation; and (iii) other typographical errors. Applicant's amendments to the specification made herein are to the application as published. As such, the paragraph numbers used herein align with those in the application as published.

The only exception to the above is with respect to the first paragraph on page 1 of the specification as filed, to which the examiner objected. This paragraph does not appear in the specification as published.

Please amend the first paragraph on page 1 of the specification as indicated:

~~TO ALL WHOM IT MAY CONCERN:~~

~~Be it known that WE, Yu-ro Lee, Jae-Hong Park, Chong-Won Lee and Jeong-Hwa Ye, respectively, whose post office address is 1451-34 Seocho-Dong, Seocho-Ku, Seoul, Korea, have made an invention in~~

~~DATA TRANSMISSION METHOD FOR HYBRID ARQ TYPE II/III UPLINK FOR A WIDE-BAND RADIO COMMUNICATION SYSTEM~~

~~of which the following is a~~

Title: Data Transmission Method for Hybrid ARQ Type II/III Uplink for a Wide-Band Radio Communication System

Inventors: Yu-ro Lee, Jae-Hong Park, Chong-Won Lee and Jeong-Hwa Ye, whose post office address is 1451-34 Seocho-Dong, Seocho-Ku, Seoul, Korea

SPECIFICATION

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

Please amend paragraph [0006] of the specification as indicated:

[0006] "Node B-L1" ~~"Node B-LI"~~ is a physical channel layer entity of a node B. The node B represents a base transceiver station (BTS) in an asynchronous IMT-2000 system. In this specification, "node B" has ~~the node B is used as~~ the same meaning as ~~the~~ "base transceiver station (BTS)."

Please amend paragraph [0011] of the specification as indicated:

~~[0011] "User equipment radio resource control (UE-RRC)" is a radio resource control protocol level entity of a user equipment (UE) (or a mobile station). "Iub" denotes an interface between the RNC and the Node B (BTS).~~

[0011] "User equipment-radio resource control (UE-RRC)" is a radio resource control protocol level entity of a user equipment (UE) (or a mobile station).

[0011.1] "Iub" denotes an interface between the RNC and the Node B (BTS).

Please amend paragraph [0012] of the specification as indicated:

[0012] "Iur" ~~"Iur"~~ denotes an interface between the RNC and another RNC.

Please amend paragraph [0017] of the specification as indicated:

[0017] When transporting [[the]] data from a radio network of a UMTS terrestrial radio access network (UTRAN) to a [[the]] mobile station (MS) (also known as a user equipment (UE)), a Hybrid ARQ type II/III, which has superior throughput as compared with [[than]] a Hybrid ARQ type I, may be used.

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

Please amend paragraph [0020] of the specification as indicated:

[0020] A Hybrid ARQ type II/III is adapted between the UE 100 and the asynchronous radio network 200. When [[a]] received data has an error, a receiver requests that a transmission part [[to]] re-transmit the received data.

Please amend paragraph [0022] of the specification as indicated:

[0022] FIG. 2 is a diagram showing a general UTRAN. In FIG. 2, the Iu is an interface between the radio communication core network 300 and the asynchronous radio network 200, the Iur is ~~and, the Iur means~~ a logical interface between radio network controllers (RNC) of the asynchronous radio networks 200, and the Iub is ~~Iub shows~~ an interface between the RNC and the Node B. Meanwhile, ~~the~~ Uu is ~~shows~~ a radio interface between the UTRAN and the UE.

Please amend paragraph [0023] of the specification as indicated:

[0023] Here, ~~In here,~~ the Node B is a logical node, ~~which is~~ responsible for [[a]] radio transmission and receiving ~~transmission/receiving~~ from one or more cells ~~cell~~ to the UE.

Please amend paragraph [0024] of the specification as indicated:

[0024] Generally in the UTRAN, if [[a]] received data has an error, the receiver requests re-transmission of the data by [[to]] the transmission part by using an automatic repeat request (ARQ) method. [[The]] ARQ methods are ~~method is~~ divided into ~~to~~ ARQ type I, II and III, the [[and]] technical characteristics of which ~~each type~~ are described below.

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

Please amend paragraph [0025] of the specification as indicated:

[0025] [[The]] ARQ is an error control protocol, which automatically senses an error during transmission and then requests re-transmission of the error-containing block. That is, [[the]] ARQ is a ~~one of~~ data transmission error control method[[s]], and when an error is detected, ~~automatically generates~~ a re-transmission request signal is automatically generated to cause re-transmission of the data.

Please amend paragraph [0026] of the specification as indicated:

[0026] The ARQ method is used in the UTRAN for [[a]] transmission of packet data. The receiver requests that the transmission part [[to]] re-transmit an error-containing packet. However, when using the ARQ method, if the number of re-transmission requests is [[are]] increased, then the throughput, which is amount of data [[to be]] transmitted in a predetermined period, may be decreased. To solve the problem, [[the]] ARQ can be used along with a forward error correction coding (FEC) method, which is called [[a]] hybrid ARQ (HARQ).

Please amend paragraph [0027] of the specification as indicated:

[0027] Hybrid ~~The hybrid~~ ARQ has ~~three~~ types: I, II and III.

Please amend paragraph [0029] of the specification as indicated:

[0029] In case of type II ARQ, if the receiver requests data re-transmission, then the data is stored onto a buffer at the receiver, and the stored data is combined with the re-transmitted data. That is, at first, the data is transmitted with a high coding rate, and in case of re-transmitting, the data is transmitted with a low coding rate, and it is combined with the pre-

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

received stored data to increase efficiency compared to [[the]] type I. For example, a convolutional coding rate 1/4, which is a mother code, may generate[[s]] coding rates 8/9, 2/3 or 1/4 by puncturing, and this [[it]] is called a rate compatible punctured convolutional (RCPC) code.

Please amend paragraph [0032] of the specification as indicated:

[0032] The type III ARQ is similar to the type II ARQ. It is different in that the re-transmitted ver(n) data is decoded before combined with the ver(n-a) data, and checked by the CRC; then, if there is no error, the ver(n) data is transmitted to an upper layer. If an error is detected, the re-transmitted ver(n) data is combined with the ver(n-a) data, and checked by the CRC to determine if further data re-transmission is necessary.

Please amend paragraph [0034] of the specification as indicated:

[0034] The hybrid ARQ type II/III combines initially-transmitted ~~a first~~ data which is encoded with a high coding rate and retransmitted ~~a re-transmit~~ data which is encoded with a low coding rate in the receiver to increase the throughput. Therefore, relational information such as ~~between~~ a sequence number and a version number ~~re-transmitted version~~ of a protocol data unit (PDU) is needed to be known in advance. The relational information should be transmitted with a low coding rate, regardless of the ~~re-transmission~~ coding rate used for the re-transmitted data, thereby ensuring the relational information's [[its]] quality of communication.

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

Please amend paragraph [0035] of the specification as indicated:

[0035] However, for the hybrid ARQ type II/III in the UTRAN, the data is transmitted with a [[the]] high coding rate, thereby increasing the possibility of an error in the [[of a]] header of a RLC-PDU. Therefore, a method of stably transmitting the RLC-PDU header is required.

Please amend paragraph [0036] of the specification as indicated:

[0036] It is, therefore, an object of the present invention to provide a data delivery method for hybrid ARQ type II/III [[II/Ill]] on the uplink of wide-band radio communication system and a computer readable recording media having program instructions ~~instructionS~~ for performing the method.

Please amend paragraph [0037] of the specification as indicated:

~~**[0037]** In accordance with an aspect of the present invention, there is provided a data processing method for the hybrid ARQ type II/III on a uplink of a wide-band radio communication system, comprising the steps of: a) generating a radio link control protocol data unit (hereinafter, referred to as a RCL-PDU) used for combining pre-transmitted data and re-transmitted data with changeable coding rate in a radio link control (hereinafter, referred to as a RLC) layer, and a protocol data unit which includes information from the RLC-PDU (hereinafter, referred to as a HARQ-RLC-Control-PDU); b) transmitting the RLC-PDU and the HARQ-RLC-Control-PDU to a medium access control dedicated (hereinafter, referred to as a MAC-D) treating a general user part in a receiver medium access control (hereinafter, referred to as a MAC) layer through a logical channel; c) transforming the RLC-PDU and the HARQ-RLC-Control-PDU received from the receiver RLC layer to MAC-PDU and HARQ-MAC-Control-~~

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

~~PDU and transmitting the transformed MAC-PDU and the HARQ-MAC-Control-PDU to a physical layer through a transport channel; and d) transforming the MAC-PDU and the HARQ-MAC-Control-PDU received from the MAC-D to a radio transmission form and then transmitting them to a receiver through the physical layer.~~

[0037] In accordance with an aspect of the present invention, there is provided a data processing method for a hybrid automatic repeat request (HARQ) type II/III on an uplink of a wide-band radio communication system, the method comprising the steps of: a) generating a radio link control (RLC) – protocol data unit (PDU) (RLC-PDU), used for combining pre-transmitted data and re-transmitted data with a changeable coding rate, in a transmitting RLC layer, and a HARQ-RLC-Control-PDU based on header information of the RLC-PDU; b) transmitting the RLC-PDU and the HARQ-RLC-Control-PDU to a transmitting medium access control dedicated entity (MAC-D) of a transmitting medium access control (MAC) layer through a first logical channel; c) transforming the RLC-PDU and the HARQ-RLC-Control-PDU received from the transmitting RLC layer into a MAC-PDU and a HARQ-MAC-Control-PDU, respectively, and then transmitting the MAC-PDU and the HARQ-MAC-Control-PDU to a transmitting physical layer through a first transport channel; and d) transforming the MAC-PDU and the HARQ-MAC-Control-PDU received from the transmitting MAC-D to a radio transmission form, wherein at least the HARQ-MAC-Control PDU is encoded using a low coding rate, and then transmitting the radio transmission form to a receiver through a physical channel.

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

Please amend paragraph [0038] of the specification as indicated:

~~[0038] The present invention further includes the steps of: e) storing a received RLC-PDU to a buffer and generating a data identifier to identify the RLC-PDU, then transmitting the RLC-PDU and the HARQ-RLC-Control-PDU to the MAC-D of the receiving MAC layer, through a transport channel; f) transmitting the HARQ-RLC-Control-PDU and the data identifier to the receiving RLC layer through a logical channel; g) transmitting a sequence number and a version number acquired by analyzing the HARQ-RLC-Control-PDU to a radio resource control (hereinafter, referred to as a RRC) layer with the data identifier; h) transmitting the sequence number, the version number and the data identifier to the physical layer; i) determining whether to decode the RLC-PDU stored in the buffer directly by using the sequence number, the version number and the data identifier or to decode after combining with the RLC-PDU of a previous version, then transmitting the RLC-PDU to a receiver physical layer; j) transmitting the decoded RLC-PDU to the MAC-D through the transport channel; k) transmitting the RLC-PDU received from the receiving physical layer to the receiving RLC layer through the logical channel; and l) transmitting the RLC-PDU after analyzing it in the RLC layer to an upper layer and transmitting a response to the receiver RLC layer.~~

[0038] The present invention further includes the steps of: e) upon receipt of the radio transmission form, storing the RLC-PDU to a buffer and generating a data identifier to identify the RLC-PDU, then transmitting the data identifier and the HARQ-RLC-Control-PDU to a receiving MAC-D of a receiving MAC layer through a second transport channel; f) transmitting the data identifier and the HARQ-RLC-Control-PDU to a receiving RLC layer through a second logical channel; g) transmitting the sequence number and the version number, acquired by analyzing the HARQ-RLC-Control-PDU, along with the data identifier, to a receiving radio

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

resource control (RRC) layer; h) transmitting the sequence number, the version number and the data identifier to a receiving physical layer; i) determining whether to decode the RLC-PDU stored in the buffer directly by using the sequence number, the version number and the data identifier, or to decode the RLC-PDU after combining the RLC-PDU with an RLC-PDU of a previous version, and then transmitting the decoded RLC-PDU to the receiving physical layer; j) transmitting the decoded RLC-PDU to the receiving MAC-D through the second transport channel; k) transmitting the decoded RLC-PDU received from the receiving physical layer to the receiving RLC layer through the second logical channel; and l) transmitting the decoded RLC-PDU, after analyzing it in the receiving RLC layer, to a receiving upper layer, and transmitting a response to the transmitting RLC layer.

Please amend paragraph [0039] of the specification as indicated:

~~[0039] In accordance with another aspect of the present invention, there is provided a data processing method for the hybrid ARQ type II/III on an uplink of a wide band radio communication system, comprising the steps of: a) storing a radio link control protocol data unit (hereinafter, referred to as a RLC-PDU) to a buffer and generating a data identifier to identify the RLC-PDU, then, transmitting the RLC-PDU with a protocol data unit which includes information from the RLC-PDU (hereinafter, referred to as a HARQ-RLC-Control-PDU) to a medium access control dedicated (hereinafter, referred to as a MAC-D), which treats a general user equipment of a MAC layer, through a transport channel; b) transmitting the HARQ-RLC-Control-PDU and the data identifier to the RLC layer through a logical channel; c) transmitting a sequence number and a version number acquired by analyzing the HARQ-RLC-Control-PDU to a radio resource control (hereinafter, referred to as a RRC) with the data identifier; d)~~

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

~~transmitting the sequence number, the version number and the data identifier to the physical layer; e) determining whether to decode the RLC-PDU stored in the buffer directly by using the sequence number, the version number and the data identifier or to decode the RLC-PDU after combining it with an RLC-PDU of a previous version, then, transmitting the decoded RLC-PDU to a physical layer; f) transmitting the decoded RLC-PDU to the MAC-D through the transport channel; g) transmitting the RLC-PDU received from the physical layer to the RLC layer through the logical channel; and h) transmitting the RLC-PDU after analyzing it in the RLC layer to an upper layer and transmitting a response to the RLC layer of the user equipment.~~

[0039] In accordance with another aspect of the present invention, there is provided a data processing method for a hybrid automatic repeat request (HARQ) type II/III on an uplink of a wide-band radio communication system, the method comprising the steps of: a) storing a radio link control (RLC) – protocol data unit (PDU) (RLC-PDU) to a buffer, generating a data identifier to identify the RLC-PDU, and then transmitting the data identifier and a HARQ-RLC-Control-PDU that includes information from the RLC-PDU to a medium access control dedicated entity (MAC-D) of a medium access control (MAC) layer, through a transport channel; b) transmitting the data identifier and the HARQ-RLC-Control-PDU to an RLC layer through a logical channel; c) transmitting a sequence number and a version number, acquired by analyzing the HARQ-RLC-Control-PDU, along with the data identifier, to a radio resource control (RRC) layer; d) transmitting the sequence number, the version number and the data identifier to a physical layer; e) determining whether to decode the RLC-PDU stored in the buffer directly by using the sequence number, the version number and the data identifier, or to decode the RLC-PDU after combining the RLC-PDU with an RLC-PDU of a previous version, and then transmitting the decoded RLC-PDU to the physical layer; f) transmitting the decoded RLC-PDU

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

to the MAC-D through the transport channel; g) transmitting the decoded RLC-PDU received from the physical layer to the RLC layer through the logical channel; and h) transmitting the decoded RLC-PDU, after analyzing it in the RLC layer, to an upper layer, and transmitting a response to an RLC layer of a user equipment.

Please amend paragraph [0040] of the specification as indicated:

~~**[0040]** In accordance with further another aspect of the present invention, there is provided a computer readable data recording media having instructions for implementing a data processing method for a hybrid ARQ type II/III on a uplink of a wide-band radio communication system having a processor, comprising the functions of: a) generating a radio link control protocol data unit (hereinafter, referred to as a RCL PDU) used for combining pre-transmitted data and re-transmitted data with a changeable coding rate in a radio link control (hereinafter, referred to as a RLC) layer and a protocol data unit which includes information of the RLC PDU (hereinafter, referred to as a HARQ RLC Control PDU); b) transmitting the RLC PDU and the HARQ RLC Control PDU to a medium access control dedicated (hereinafter, referred to as a MAC D) treating a general user part in a medium access control (hereinafter, referred to as a MAC) layer through a logical channel; c) transforming the RLC PDU and the HARQ RLC Control PDU received from the layer to MAC PDU and HARQ MAC Control PDU and transmitting the transformed MAC PDU and the HARQ MAC Control PDU to a physical layer through a transport channel; and d) transforming the MAC PDU and the HARQ MAC Control PDU received from the MAC D to a radio transmission form and then transmitting them to a receiver through the physical layer.~~

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

[0040] In accordance with further another aspect of the present invention, there is provided a computer readable data recording media having instructions for implementing a data processing method for a hybrid automatic repeat request (HARQ) type II/III on an uplink of a wide-band radio communication system having a processor, the method comprising the functions of: a) generating a radio link control (RLC) – protocol data unit (PDU) (RLC-PDU), used for combining pre-transmitted data and re-transmitted data with a changeable coding rate, in a transmitting RLC layer, and a HARQ-RLC-Control-PDU based on header information of the RLC-PDU; b) transmitting the RLC-PDU and the HARQ-RLC-Control-PDU to a transmitting medium access control dedicated entity (MAC-D) of a transmitting medium access control (MAC) layer, through a first logical channel; c) transforming the RLC-PDU and the HARQ-RLC-Control-PDU received from the transmitting RLC layer into a MAC-PDU and a HARQ-MAC-Control-PDU, respectively, and transmitting the MAC-PDU and the HARQ-MAC-Control-PDU to a transmitting physical layer through a first transport channel; and d) transforming the MAC-PDU and the HARQ-MAC-Control-PDU received from the MAC-D to a radio transmission form, wherein at least the HARQ-MAC-Control PDU is encoded using a low coding rate, and then transmitting the radio transmission form to a receiver through a physical channel.

Please amend paragraph [0041] of the specification as indicated:

~~[0041] The present invention further includes the functions of: e) storing a received RLC-PDU to a buffer and generating a data identifier to identify the RLC-PDU, then transmitting the RLC-PDU and the HARQ-RLC-Control-PDU to the MAC-D of the receiving MAC layer through the transport channel; f) transmitting the HARQ-RLC-Control-PDU and the data~~

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

~~identifier to the receiving RLC layer through a logical channel; g) transmitting a sequence number and a version number acquired by analyzing the HARQ-RLC-Control-PDU to a radio resource control (hereinafter, referred to as a RRC) layer with the data identifier; h) transmitting the sequence number, the version number and the data identifier to the physical layer; i) determining whether to decode the RLC-PDU stored in the buffer directly by using the sequence number, the version number and the data identifier or to decode the RLC-PDU after combining it with the RLC-PDU of a previous version, then, transmitting the decoded RLC-PDU to a receiver physical layer; j) transmitting the decoded RLC-PDU to the MAC-D through the transport channel; k) transmitting the RLC-PDU received from the receiving physical layer to the receiving RLC layer through the logical channel; and l) transmitting the RLC-PDU after analyzing it in the RLC layer to an upper layer and transmitting a response to the receiver RLC layer.~~

[0041] The present invention further includes the functions of: e) storing the received RLC-PDU to a buffer and generating a data identifier to identify the RLC-PDU, then transmitting the data identifier and the HARQ-RLC-Control-PDU to a receiving MAC-D of a receiving MAC layer through a second transport channel; f) transmitting the data identifier and the HARQ-RLC-Control-PDU to a receiving RLC layer through a second logical channel; g) transmitting a sequence number and a version number, acquired by analyzing the HARQ-RLC-Control-PDU, along with the data identifier, to a receiving radio resource control (RRC) layer; h) transmitting the sequence number, the version number and the data identifier to a receiving physical layer; i) determining whether to decode the RLC-PDU stored in the buffer directly by using the sequence number, the version number and the data identifier, or to decode the RLC-PDU after combining it with the RLC-PDU of a previous version, and then transmitting

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

the decoded RLC-PDU to the receiving physical layer; j) transmitting the decoded RLC-PDU to the receiving MAC-D through the second transport channel; k) transmitting the decoded RLC-PDU received from the receiving physical layer to the receiving RLC layer through the second logical channel; and l) transmitting the decoded RLC-PDU, after analyzing it in the receiving RLC layer, to a receiving upper layer, and transmitting a response to the transmitting RLC layer.

Please amend paragraph [0042] of the specification as indicated:

~~[0042] In accordance with still further another aspect of the present invention, there is provided a computer readable data recording media having instructions for implementing a data processing method for a hybrid ARQ type II/III on a uplink of a wide band radio communication system having a processor, comprising the functions of: a) storing a radio link control protocol data unit (hereinafter, referred to as a RLC-PDU) to a buffer and generating a data identifier to identify the RLC-PDU then, transmitting the RLC-PDU with a protocol data unit which includes information from the RLC-PDU (hereinafter, referred to as a HARQ-RLC-Control-PDU) to a medium access control dedicated (hereinafter, referred to as a MAC-D), which treats a general user equipment of a MAC layer, through a transport channel; b) transmitting the HARQ-RLC-Control-PDU and the data identifier to the RLC layer through a logical channel; c) transmitting a sequence number and a version number acquired by analyzing the HARQ-RLC-Control-PDU to a radio resource control (hereinafter, referred to as a RRC) with the data identifier; d) transmitting the sequence number, the version number and the data identifier to the physical layer; e) determining whether to decode the RLC-PDU stored in the buffer directly by using the sequence number, the version number and the data identifier or to decode the RLC-PDU after combining it with an RLC-PDU of a previous version, then transmitting the decoded RLC-PDU~~

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

~~to the physical layer; f) transmitting the decoded RLC-PDU to the MAC-D through the transport channel; g) transmitting the RLC-PDU received from the physical layer to the RLC layer through the logical channel; and h) transmitting the RLC-PDU after analyzing it in the RLC layer to an upper layer and transmitting a response to the RLC layer of the user equipment.~~

[0042] In accordance with still further another aspect of the present invention, there is provided a computer readable data recording media having instructions for implementing a data processing method for a hybrid automatic repeat request (HARQ) type II/III on an uplink of a wide-band radio communication system having a processor, the method comprising the functions of: a) storing a radio link control (RLC) – protocol data unit (PDU) (RLC-PDU) to a buffer and generating a data identifier to identify the RLC-PDU, and then transmitting the data identifier and a HARQ-RLC-Control-PDU that includes information from the RLC-PDU to a medium access control dedicated entity (MAC-D) of a medium access control (MAC) layer, through a transport channel; b) transmitting the data identifier and the HARQ-RLC-Control-PDU to an RLC layer through a logical channel; c) transmitting a sequence number and a version number, acquired by analyzing the HARQ-RLC-Control-PDU, along with the data identifier, to a radio resource control (RRC) layer; d) transmitting the sequence number, the version number and the data identifier to a physical layer; e) determining whether to decode the RLC-PDU stored in the buffer directly by using the sequence number, the version number and the data identifier, or to decode the RLC-PDU after combining the RLC-PDU with an RLC-PDU of a previous version, and then transmitting the decoded RLC-PDU to the physical layer; f) transmitting the decoded RLC-PDU to the MAC-D through the transport channel; g) transmitting the RLC-PDU received from the physical layer to the RLC layer through the logical channel; and h) transmitting the

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

RLC-PDU, after analyzing it in the RLC layer, to an upper layer, and transmitting a response to an RLC layer of a user equipment.

[0042.1] In accordance with another aspect of the present invention, there is provided a data processing method for a hybrid automatic repeat request (HARQ) type II/III on an uplink of a wide-band radio communication system, the method comprising the steps of: a) responsive to a request to retransmit data to a receiver, generating in a radio link control (RLC) layer (i) a data packet comprising a header and a payload, the header comprising a plurality of header fields, the payload comprising the data, and (ii) a control packet comprising at least one value copied from at least one of the header fields, the at least one value comprising a sequence number and a version number; b) transmitting the data packet and the control packet from the RLC layer to a medium access control (MAC) layer via at least one logical channel; c) transmitting the data packet and the control packet from the MAC layer to a physical layer via at least one transport channel; d) packaging the data packet and the control packet into a single radio transmission unit, wherein at least the control packet is encoded using a low coding rate; and f) transmitting the radio transmission unit to the receiver via a physical channel.

[0042.2] In accordance with another aspect of the present invention, there is provided a data processing method for a hybrid automatic repeat request (HARQ) type II/III on an uplink of a wide-band radio communication system, the method comprising the steps of: a) transmitting a request that a transmitter retransmit data; b) receiving at a physical layer via a physical channel a radio transmission unit comprising (i) a data packet comprising a header and a payload, the header comprising at least one header field, the payload comprising the data, and (ii) a control packet comprising at least one value copied from the at least one header field, the at least one value comprising a sequence number and a version number, the control packet having been

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

encoded using a low coding rate; c) storing the data packet to a buffer; d) generating a data identifier to identify the data packet; e) transmitting the data identifier and the control packet from the physical layer to a medium access control (MAC) layer via at least one transport channel; f) transmitting the data identifier and the control packet from the MAC layer to a radio link control (RLC) layer via at least one logical channel; g) transmitting the sequence number and the version number, acquired by analyzing the control packet, along with the data identifier, from the RLC layer to a radio resource control (RRC) layer; h) transmitting the sequence number, the version number and the data identifier from the RRC layer to the physical layer; i) making a determination whether to decode the data packet stored in the buffer directly by using the sequence number, the version number and the data identifier, or to decode the data packet after combining the data packet with a data packet of a previous version; j) decoding the data packet based on the determination; k) transmitting the decoded data packet to the physical layer; l) transmitting the decoded data packet from the physical layer to the MAC layer via the at least one transport channel; m) transmitting the decoded data packet from the MAC layer to the RLC layer via the at least one logical channel; n) transmitting the decoded data packet from the RLC layer to an upper layer; and o) transmitting a response from the RLC layer to an RLC layer of the transmitter.

Please amend paragraph [0045] of the specification as indicated:

[0045] To perform the combining on the hybrid ARQ type II/III, the receiver may have information pertaining to [[of]] the ~~current receiving~~ RLC-PDU currently being received, and this [[the]] information ~~composing part of the RLC PDU~~ should be transmitted more stably than the RLC-PDU ~~a currently transmitted data~~.

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

Please amend paragraph [0046] of the specification as indicated:

[0046] For the above, the present invention generates the HARQ-RLC-Control-PDU referring to the RLC-PDU, wherein the HARQ-RLC-Control-PDU ~~HARQ-RLC-Control-PUD~~ has information of the RLC-PDU which is used for supporting the hybrid ARQ type II/III. ~~II/III.~~ At this time, the HARQ-RLC-Control-PDU includes a sequence number and a version number of the RLC-PDU.

Please amend paragraph [0047] of the specification as indicated:

[0047] The RLC-PDU and the HARQ-RLC-Control-PDU ~~HARQ-RLC-Control-PUD~~ are transmitted from an [[a]] RLC protocol entity to a MAC-D protocol entity by using [[a]] different logical channels or the same logical channel, ~~and~~ transmitted from a MAC-C/SH protocol entity to a physical layer by using a dedicated channel (DCH), and transmitted to the receiver through a physical channel, such as a dedicated physical channel (DPCH).

Please amend paragraph [0051] of the specification as indicated:

[0051] FIG. 3 is a diagram showing protocol stacks in the general UTRAN;

Please amend paragraph [0052] of the specification as indicated:

[0052] FIG. 4 is a diagram showing relations among conventional RLC-PU, RLC-PDU, ~~RLCPDU,~~ MAC-PDU and transport block;

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

Please amend paragraph [0058] of the specification as indicated:

[0058] As described in FIG. 4, an [[a]] RLC-PDU includes one or more RLC-PU ~~RLC-PDU~~ and the RLC-PDU is mapped to a MAC-PDU. The MAC-PDU is mapped to a transmission block of a physical layer and then a CRC is added thereto.

Please amend paragraph [0059] of the specification as indicated:

[0059] In the physical layer, the RLC-PDU is transmitted through an encoding unit, a rate matching unit, an interleaver and a modulating unit, and in a receiver, the RLC-PDU is passed through a demodulating unit, a deinterleaver and a decoding unit, and the CRC of the data is checked to determine whether an error exists ~~is exist~~ or not in the transmitted data. If an error exists, the receiver requests [[a]] re-transmission of the data and the error-generating data is stored in the buffer. At this time, the re-transmitted RLC-PDU is combined with the RLC-PDU ~~RLCPDU~~ stored in the buffer, ~~and performs~~ the decoding process is performed, and then ~~checks~~ the CRC is checked. In this case, the sequence number and the version number of the currently received RLC-PDU should be known. Also, in case of the hybrid ARQ type II/III, a beginning transmission is carried out with a high coding rate; as such, an error in the header of the RLC-PDU is more likely. ~~so, an error generating possibility of a header of the RLC-PDU is increased.~~

Please amend paragraph [0063] of the specification as indicated:

[0063] When ~~In case of~~ using a [[the]] different type of [[the]] logical channel, the RLC-PDU uses a logical channel[[,]] such as a dedicated traffic channel (DTCH), and the HARQ-RLC-Control-PDU uses a logical channel[[,]] such as a dedicated control channel (DCCH),

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

~~DTTC~~ and a primitive known as a MAC data request (MAC-Data-REQ) is used ~~MAC-Data-REQ is used as a primitive~~.

Please amend paragraph [0064] of the specification as indicated:

[0064] When ~~In case of~~ using the same type of the logical channel, the RLC-PDU and the HARQ-RLC-Control-PDU use a logical channel[[,]] such as DTCH, and MAC-Data-REQ is used as a primitive.

Please amend paragraph [0065] of the specification as indicated:

[0065] The MAC-D protocol entity transforms the RLC-PDU and the HARQ-RLC-Control-PDU ~~HARQRLC-Control-PDU~~ to a MAC-PDU and a HARQ-MAC-Control-PDU, respectively. Then, they are transmitted to the physical layer in a transport block form and a primitive known as a physical layer data request (PHY-Data-REQ) is used ~~PHY-Data-REQ is used as a primitive~~.

Please amend paragraph [0066] of the specification as indicated:

[0066] In the physical layer, a CRC is added to a DCH transport block, and then the transport block ~~CRC~~ is transmitted to the receiver through the physical channel, such as DPCH, after the encoding unit, the rate matching unit, the interleaver and the modulating unit.

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

Please amend paragraph [0068] of the specification as indicated:

[0068] As described in FIG. 5, the RLC protocol entity, the MAC-D protocol entity, the MAC-C/SH protocol entity and the physical layer are initialized by the RRC protocol entity to perform normal operation in each of the protocol entities ~~entity~~ at step 501.

Please amend paragraph [0075] of the specification as indicated:

[0075] As illustrated in FIG. 6, the RLC protocol entity, the MAC-D protocol entity, the MAC-C/SH protocol entity and the physical layer are initialized by the RRC protocol entity to perform normal operation in each of the protocol entities ~~entity~~ at step 601.

Please amend paragraph [0077] of the specification as indicated:

[0077] After that, the physical layer of the receiver node B carries out the demodulating, the deinterleaving and the decoding processes to the HARQ-RLC-Control-PDU ~~HARQ-RLC-ControlPDU~~ that is received through the physical channel, such as the DPCH, then transmits the HARQ-RLC-Control-PDU to the MAC-D protocol entity through the transport channel, such as the DCH. At this time, the radio frame that has the received RLC-PDU is stored in the buffer. A data identifier is generated to identify the RLC-PDU stored in the buffer and is transmitted to the MAC-D protocol entity with the HARQ-RLC-Control-PDU at step 603. At this time, the Iub [[lub]] interface is used between the node B and MAC-D.

Please amend paragraph [0078] of the specification as indicated:

[0078] Subsequently, the MAC-D protocol entity receives the HARQ-MAC-Control-PDU ~~HARQ-MACControl-PDU~~ having the HARQ-RLC-Control-PDU, and the data identifier

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

from the physical layer, and transforms the HARQ-MAC-Control-PDU to the HARQ-RLC-Control-PDU ~~HARQ-RLCNY02 Control PDU~~, then transmits the HARQ-RLC-Control-PDU and the data identifier to the RLC protocol entity through the logical channel, such as the DTCH at step 604.

Please amend paragraph [0080] of the specification as indicated:

[0080] The RLC protocol entity interprets the received HARQ-RLC-Control-PDU to extract ~~extracts~~ the sequence number and the version number, then transmits a primitive known as a control RLC HARQ indication (CRLC-HARQ-IND), ~~CRLC-HARQINC primitive~~ having the sequence number, the version number and the data identifier as parameters, to the RRC protocol entity through a control Service Access Point (SAP) [[SAP]] at step 605.

Please amend paragraph [0081] of the specification as indicated:

[0081] Next, the RRC protocol entity transmits a primitive known as a control physical layer HARQ request (CPHY-HARQ-REQ) ~~CPHY-HARQ-REQ primitive~~ that has as parameters the sequence number, the version number and the data identifier, which are parameters of the CRLC-HARQ-IND primitive ~~as parameters~~, to the physical layer through a control SAP between the RRC and the physical layer L1 at step 606.

Please amend paragraph [0082] of the specification as indicated:

[0082] Then the physical layer of the receiver extracts the radio frame, which has the RLC-PDU stored in the buffer, by using the received data identifier, and carries out the demodulating, the deinterleaving and the decoding processes to the radio frame by using the

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

sequence number and the version number, then transmits the radio frame to the MAC-D protocol entity by using the transport channel, such as the DCH at step 607. That is, node B-L1 determines whether to directly decode ~~decoding~~ the RLC-PDU stored in the buffer by using the sequence number, the version number and the data identifier or to decode the RLC-PDU after combining the RLC-PDU with the RLC-PDU of a previous version number, [[then]] performs the decoding and transmits the decoded RLC-PDU to the MAC-D protocol entity through a transport channel, such as the DCH.

Please amend paragraph [0086] of the specification as indicated:

[0086] First, a UE-RLC protocol entity generates an RLC-PDU and transmits the generated RLC-PDU to a UE-MAC-D protocol entity through a logical channel (using a primitive such as a MAC-D data request (MAC-D-Data-REQ)) ~~(MAC-DData-REQ primitive),~~ such as DTCH at step 701.

Please amend paragraph [0087] of the specification as indicated:

[0087] The UE-RLC protocol entity generates the HARQ-RLC-Control-PDU by using header information of the RLC-PDU and transmits the generated HARQ-RLC-Control-PDU ~~HARQ-RLCControl-PDU~~ to the UE-MAC-D protocol entity by using a logical channel (and by using a MAC-D-Data-REQ primitive) ~~(MAC-DData-REQ primitive),~~ such as the dedicated control channel (DCCH) [[DCCH]] at step 702. At this time, the generated HARQ-RLC-Control-PDU ~~HARQRLC Control PDU~~ includes information like the sequence number and the version number.

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

Please amend paragraph [0088] of the specification as indicated:

[0088] When ~~In case of~~ using the same type of [[the]] logical channel, the UE-RLC protocol entity generates the HARQ-RLC-Control-PDU (of course, it includes the sequence number and the version number information) by using header information of the RLC-PDU, ~~RLCPDU~~ and transmits the generated HARQ-RLC-Control-PDU to the UE-MAC-D protocol entity by using the logical channel (and by using a MAC-D-Data-REQ primitive), such as the DTCH.

Please amend paragraph [0092] of the specification as indicated:

[0092] Node B-L1 ~~Node B-Li~~ of the radio network receives the radio frame that has the RLC-PDU and the HARQ-RLC-Control-PDU from the UE-L1 through the physical channel, such as the DPCH and carries out the demodulating, the deinterleaving and the decoding processes. Then the radio frame, which has the RLC-PDU, is stored in the buffer and the data identifier is generated to identify the radio frame stored in the buffer. After that, the node B-L1 transmits the HARQ-MAC-Control-PDU and the data identifier to a RNC-MAC-D protocol entity through the transport channel (using a primitive known as a physical layer data indication (PHY-Data-IND)) ~~(PHY-Data-IND primitive),~~ such as the DCH at step 706.

Please amend paragraph [0093] of the specification as indicated:

[0093] The RNC-MAC-D protocol entity transmits the HARQ-RLC-Control-PDU and the data identifier to a RNC-RLC protocol entity through the logical channel (using a primitive known as a MAC-D data indication (MAC-D-Data-IND)) ~~(MACD-Data-IND primitive),~~ such as the DCCH at step 707. When ~~In case of~~ using the RNC-MAC-D protocol entity, the HARQ-

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

RLC-Control-PDU and the data identifier are transmitted to the RNC-RLC protocol entity through the logical channel (MAC-D-Data-IND primitive), such as the DTCH.

Please amend paragraph [0094] of the specification as indicated:

[0094] Subsequently, the RNC-RLC protocol entity interprets the received HARQ-RLC-Control-PDU and extracts the sequence number and the version number. The data identifier, the sequence number and the version number are transmitted to the RNC-RRC protocol entity as a CRLC-HARQ-IND primitive by using a control SAP defined between the RNC-RLC protocol entity ~~current RLC PDU~~ and the RNC-RRC protocol entity at step 708.

Please amend paragraph [0095] of the specification as indicated:

[0095] Then, the RNC-RRC protocol entity transmits the CPHY-HARQ-REQ primitive having the data identifier, the sequence number and the version number as parameters, to the node B-L1 by using a control SAP defined between the node B-L1 ~~current node B-Li~~ and the RNC-RRC protocol entity at step 709. The node B-L1 carries out the demodulating, the deinterleaving and the decoding processes to the radio frame having the RLC-PDU stored in the buffer by using the received data identifier, the radio frame having been ~~and to the radio frame, which is~~ stored by using the sequence number and the version number, and then ~~then,~~ transmits the decoded RLC-PDU [[them]] to the RNC-MAC-D ~~RNCMAC-D~~ protocol entity through the transport channel (PHY-Data-IND primitive), such as the DCH at step 710.

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

Please amend paragraph [0099] of the specification as indicated:

[0099] In the present invention, in cases ~~ease~~ of [[an]] radio communication systems using ~~system uses~~ the hybrid ARQ type II/III, ~~there~~ no changes are required to the pre-defined kinds and format of the RLC data PDU and control PDU. The invention adds a HARQ-RLC-Control-PDU of a new RLC-PDU type so that the hybrid ARQ type II/III is easily used without changing [[of]] the conventional RLC protocol entity operation.

Please amend the abstract of the invention as indicated:

~~A data processing method for the hybrid ARQ type II/III on a uplink of a wide band radio communication system includes the steps of: a) generating a radio link control protocol data unit (hereinafter, referred to as a RCL-PDU) used for combining pre-transmitted data and re-transmitted data with a changeable coding rate in a radio link control (hereinafter, referred to as a RLC) layer and, and protocol data unit which includes information of the RLC-PDU (hereinafter, referred to as a HARQ-RLC-Control-PDU); b) transmitting the RLC-PDU and the HARQ-RLC-Control-PDU to a medium access control dedicated (hereinafter, referred to as a MAC-D) treating a general user part in a medium access control (hereinafter, referred to as a MAC) layer through a logical channel; c) transforming the RLC-PDU and the HARQ-RLCControl-PDU received from the receiver RLC layer to MAC-PDU and HARQ-MAC-ControlPDU and transmitting the transformed MAC-PDU and the HARQ-MAC-Control-PDU to the physical layer through a transport channel; and d) transforming the MAC-PDU and the HARQMAC-Control-PDU received from the MAC-D to a radio transmission form and then transmitting them to a receiver through the physical layer.~~

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

A data processing method for a HARQ type II/III on an uplink of a wide-band radio communication system includes: a) generating a radio link control – protocol data unit (RLC-PDU), used for combining pre-transmitted data and re-transmitted data with a changeable coding rate, in an RLC layer, and a HARQ-RLC-Control-PDU based on header information of the RLC-PDU; b) transmitting the RLC-PDU and the HARQ-RLC-Control-PDU to a MAC dedicated entity (MAC-D) of a transmitting MAC layer through a logical channel; c) transforming the RLC-PDU and the HARQ-RLC-Control-PDU into a MAC-PDU and a HARQ-MAC-Control-PDU, respectively, and then transmitting the MAC-PDU and the HARQ-MAC-Control-PDU to a physical layer through a transport channel; and d) transforming the MAC-PDU and the HARQ-MAC-Control-PDU to a radio transmission form, wherein at least the HARQ-MAC-Control PDU is encoded using a low coding rate, and then transmitting the radio transmission form to a receiver through a physical channel.

McDONNELL BOEHNEN
HULBERT & BERGHOFF LLP
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001